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Treatment of Tuberculosis with Sanocrysine.—Sanocrysine is auro-sodium-thiosulphate, $Au(S_2O_3)_2Na_3$. Holger Moellgaard, Professor of Physiology in the Veterinary School at Copenhagen, has found that his compound has a specific therapeutic effect against tuberculosis, killing tubercle bacilli *in vivo* as well as *in vitro*. It is of comparatively little toxicity; 60 mgm. may be injected in normal men and animals without producing any effect. The tolerance of guinea pigs is somewhat smaller, about 30 mgm., but in mice as much as 120 mgm. per kg. may be injected. The therapeutic dose is never higher than one-third of the tolerated one, namely, 10 to 20 mgm. per kg. In man 0.5 to 1 gm. is injected for therapeutic effect. After such injections gold can be traced in the urine during six days; it is assumed that after this time the excretion is complete. The substance rapidly diffuses through animal membranes almost as well as iodides. Sanocrysine in a concentration of 1 to 100,000 stops the growth of tubercle bacilli if added to a medium containing the bacilli. If virulent bacilli are washed twice within 24 hours with a 1 to 100,000 solution most of the bacilli are killed. If washed with a 1 to 1000 solution the bacilli have lost their stability toward acids and can no longer be stained by the usual methods. Upon injecting sanocrysine into calves which were experimentally infected with tubercle bacilli, violent reactions were observed: edema of the lungs, albuminuria, hyperthermia and also hypothermia, leading invariably to the death of the animals within a few days. This is due to the endotoxins (tuberculin) contained in living bacilli and liberated when they are killed by sanocrysine. Every attempt to kill tubercle bacilli by means of chemotherapeutic agents will have to meet this difficulty. In order to make use of the curative action of sanocrysine, a means had to be found which could neutralize these endotoxins. For this purpose Moellgaard prepared an antituberculin serum by injecting calves with dead tubercle bacilli and tuberculine for weeks and months, until these animals exhibited a high immunity, as shown by complement fixation. By injecting such a serum at the same time with or shortly after sanocrysine, splendid therapeutic results were obtained in calves, artificially infected by inoculation of 20 mgm. of tubercle bacilli intravenously. The antituberculin serum proved quite efficient in curing the tuberculin shock produced by sanocrysine in these tuberculous animals. After killing the animals thus treated, some time later, no trace of tuberculous infection can be found in any organ, while in infected control animals the lungs are full of tubercles. Similar experiments were performed with rabbits and goats. In guinea pigs they cannot be performed, as these animals are too sensitive toward sanocrysine, the kidneys being affected. In spontaneous tuberculosis of cattle a similar treatment proved insufficient, owing to fibrous, caseified and calcified foci, which are not accessible to the drug. No considerable change is brought about in this form of the disease. Before starting the treatment of human lung tuberculosis, Moellgaard tried the treatment on two tuberculous monkeys obtained from the Zoological Garden at Copenhagen. He succeeded in perfectly curing these animals, in the way described. Upon proceeding to the treatment of human cases, the same difficulties were experienced, as were observed in animals infected with tubercle bacilli. Unfortunately, in men the tuberculin shock following the sanocrysine injection can be prevented only imperfectly by the antituberculin serum. The intoxication disappears only partially after administering the serum because the mixture of tuberculin and anti-

tuberculin is not entirely nonpoisonous. Besides this, through the dissolution of the tubercle bacilli not only tuberculin is liberated, but also other poisons, such as their bacillo-caseine, play a rôle. Against bacillo-caseine no antibodies are formed. In the sanocrysine treatment of tuberculous patients grave phenomena of intoxication are, therefore, to be expected even though applying antituberculin serum. In practice it is found that upon administering sanocrysine to tuberculous patients, high temperatures are seen, with vomiting, sometimes diarrhea, often skin eruptions and albuminuria. Besides these, one can observe the so called reaction of Herxheimer, consisting in a strong hyperemia of the tuberculous focus. The albuminuria is the most important of these phenomena; whenever albuminuria is observed, a tuberculin shock might be expected involving hyperthermia but often hypothermia. This is associated with a small quick pulse and cyanosis. At the same time a deceptive euphoria may mislead the physician. Only in some of the cases can these phenomena be suppressed by administering antituberculin serum. In adults 0.5 gm. sanocrysine is given as the first dose. In almost every case the reaction following this dose is small, exanthemata and albuminuria appear, as a rule, only after the second injection which amounts to 1 gm., and even then they take several days to develop in most cases. It is necessary, therefore, to postpone a third injection in order to avoid cumulative action leading to fatal results. The difference between the reaction after the second and the following injections is striking. After the second injection the temperature rises slowly, reaches its highest point after several days only, and remains high for a week. After the following injections, the rise of temperature occurs much quicker but disappears also after some days. The albumin in the urine is to be looked for very carefully at least twice daily, albuminuria being considered by all clinicians as a contraindication against further injections; the same holds for skin eruptions. The treatment is complete if six injections have been administered, or if it is not, the injections must be interrupted for a considerable period as the general state of the patient suffers too much. Concerning the application of antituberculin serum in patients, expert clinicians hold different opinions. Secher of the Bispebjaerg Hospital, who has treated 200 patients, uses very little serum. He injects it only if serious reactions occur, especially albuminuria. Faber, Professor of Internal Medicine in the University of Copenhagen, injects serum on the two days preceding the first sanocrysine injection, twice per day 20 cc., especially in grave cases. During the sanocrysine treatment the serum injections are continued. Different opinions are also held concerning the mode of injection. Some inject it intramuscularly, others intravenously. The danger of anaphylaxis is small, according to all clinicians, if continued injections of the serum are given; yet, for safety, it is preferable to inject first 1 cc., and after three minutes the rest of the 20 cc. A considerable number of tuberculous patients, treated with sanocrysine, have died owing to the treatment. About 400 patients on the whole have been treated. The first twenty-eight, being all grave cases, have all succumbed. More recently the quality of the antituberculin serum has been improved by preparing it from horses instead of from calves. Unfortunately, 60 per cent of the horses die during the immunizing injections. Also, those patients who survive the treatment suffer severely from the high temperatures and the vomiting, following the sanocrysine treatment, and invariably lose several kilos of body weight. Cachexia is, therefore, the most serious contraindication. Cachectic patients almost never survive the treatment. In some patients continuous progress of the cachexia, following the treatment, has been observed, which did not stop even after the injections had been discontinued and led to the death of the patient after some months. The reaction of Herxheimer, the local hyperemia in the tuberculous focus, is moderate as a whole, and can hardly be detected upon physical examination; it almost never produces acute involvement or blood-spitting. This reaction however has serious consequences if intestinal ulcers are present; it then leads to diarrhea, in one case even perforation of the intestine has been observed. The treatment should be continued, if possible, until further sanocrysine injections no longer produce a reaction, just as is the case in normal human-beings, free from tuberculosis. Cases have been observed, however, by Dr. Würzen in which even after a thorough and successful treatment, sensitiveness to sanocrysine appeared again. In old fibrous forms of tuberculosis, in patients with a cavity surrounded by connective tissue, a complete cure is naturally impossible. It is believed, however, that in such cases the more recent lesions can be reached by sanocrysine, and an improvement in the state of such patients has been seen. Acute tuberculous pneumonia has been treated with sanocrysine preferably. In this case, also considerable danger exists, but a number of such patients have improved so much that they can be looked upon as almost cured. In such cases

the initial doses should not be too small; 1 gm. has proved adequate. Dr. Lecher claims to have cured two cases of miliary tuberculosis by sanocrysine; also Würzen has one such case on record as cured. In tuberculous meningitis the result has been negative. Children tolerate sanocrysine better than adults. Good results have been obtained by Professor Bie, of the Blegdams Hospital, in juvenile cases which, however, were not very advanced. In surgical tuberculosis intravenous injection of sanocrysine is useless, but good results have been obtained by infiltrating tuberculous granulations with sanocrysine after opening up a fungus. According to Professor Rousing, tuberculosis of the bladder has been treated successfully by intravesical application with a 5 per cent sanocrysine solution. Tuberculosis of the eye cannot be treated, as the local reaction following sanocrysine is so strong that the eye is invariably lost. Summarizing, the writer once more points to the grave dangers involved in the sanocrysine treatment; on the other hand, he states that results have been obtained by the treatment which could not be reached by any other method. Cases of tuberculosis with an entirely unfavorable prognosis have been improved considerably. The toxic phenomena have disappeared, the vomiting has stopped, the appetite has returned and the infiltrations have become much smaller. A perfect cure is not possible in such cases. In many light cases, in which a number of fatal accidents also occurred, results were obtained which otherwise are possible only after a long sanatorium treatment. All results obtained so far in the treatment of tuberculosis must be looked upon as preliminary, and giving hope for further favorable development.—*The Treatment of Tuberculosis with Sanocrysine and Serum According to Moellgaard, I. Snapper, Nederlandsch. Tijdschr. v. Geneesk., December, 1924, lxviii, 2816.*—(*R. B.*)

Toxic Dermatitis Following Krysolgan Treatment.—Exanthemata occurred over the entire body of a 56-year-old patient with multiple glandular and bone tuberculosis, following krysolgan treatment (0.05, 0.075, 0.1, 0.1 and 0.05 gm.). Fever was also present. Aside from a slight turbidity nothing was found in the urine. The exanthem is viewed as an anaphylactic manifestation occasioned by inflammatory protein split products.—*Toxische Dermatitis durch Krysolganbehandlung (Kurzer klinischer Beitrag), G. Schellenberg, Zeitschr. f. Tuberk., November, 1923, xxxix, 94.*—(*H. J. C.*)

Herpes Zoster Following Krysolgan.—As a result of treating 40 cases of laryngeal tuberculosis a favorable impression was obtained. Complications never were noted, with one exception in which a left-sided herpes zoster with fever and pain developed in a 25-year-old patient having a widespread open acinous-nodose tuberculosis; the herpes zoster occurred after the fourth injection. Later there developed in the vicinity of the herpes a cold abscess of the rib cartilage. The exact cause is left open but the krysolgan relationship is considered significant.—*Herpes Zoster und Krysolgankur, C. Schelenz, Ztschr. f. Tuberk., May, 1924, xl, 188.*—(*H. J. C.*)

Potassium Arsenite and Manganese Iodate in Treatment of Pulmonary Tuberculosis.—*Doctojonan,* previously called *Dinatin,* which is said to consist of potassium arsenite and manganese iodate, is a nontoxic, harmless material leading to no local reaction on intramuscular injection in doses of 10 to 20 cc. It is to be looked upon as a nonspecific agent against tuberculosis, the action of which does not depend upon the allergic state of the infected body. It acts as a stimulating agent, improving the general condition. In a series of cases treated, many of them advanced, 85 per cent improved.—*Erfarhrungen mit Kaliumarsenit-Manganiodat in der Behandlung der Lungentuberkulose, T. Landgraf, München. med. Wchnschr., July 25, 1924, lxxi, 1025.*—(*E. R. L.*)

Treatment of Tuberculous Fistulae with Copper Sulphate.—The method of Heine described 30 years ago (Copper sulphate 6, zinc sulphate 6, water to 100) is more suitable than Beck's paste for injection into fistulae. The solution is injected at 4-week intervals. The healthy skin and healthy tissues should be protected from the caustic action of the mixture by means of an ointment. The injection of the copper-zinc solution is also suitable for treating nontuberculous persistent fistulae, but it should be used with caution. Harmful resorption was not noted.—*Zur Behandlung tuberkuloser Fisteln mit Kupfersulfat, F. Franke, Centralbl. f. Chir., 1924, li, 138.*—(*H. J. C.*)

Calot Injection Treatment of Surgical Tuberculosis.—Tuberculous cervical lymph nodes, suppurating tuberculous joints, cold abscesses originating in bones, and tuberculous fistulae were treated by the Calot and other injection methods. For the most part the cases had received no other treatment. Intimate contact of pathological tissue and therapeutic agent is the basis of the Calot treatment. In spite of the tissue coagulation resulting from such treat-

ment, and consequent decrease of the effectiveness of the injected material, a certain amount of scar-tissue production on the one hand, or tissue softening on the other, may be expected. When sclerosis is desired Calot has suggested a mixture prepared as follows (*Calot I*): olive oil 70, ether 30, creosote 5, guaiacol 1, iodoform 10. For tissue softening and absorption a mixture of naphtholated camphor 2, glycerine 12 (*Calot II*) is recommended. These instructions have been followed, with gratifying results. For closed, suppurating processes an injection of 8 to 15 cc. of *Calot I* is recommended, repeated every 5 to 10 days until 7 injections have been given. After the last injection the contents of the abscess are aspirated, and a compression bandage is applied. After this stimulating treatment healing usually occurs. The utmost caution must be observed to keep the process truly closed, by preventing all outside infection. Dry, fungoid types of tuberculosis are best treated by injections of 1 to 2 cc. of *Calot II* with repeated aspirations and reinjections until 7 to 10 injections have been given. Then a compression band is applied. Fistulous forms of tuberculosis are most refractory to treatment. The Calot mixtures are not suitable in this type because of rapid drainage and lack of prolonged contact. Fistulae have been injected with a paste consisting of camphor-naphthol 6, camphor-phenol 6, guaiacol 15, iodoform 20, lanolin 100, at 5-day intervals, the paste being warmed on the water-bath before injection. With this mixture healing is usually effected in 6 to 8 weeks in the less severe cases. Untoward results have not been seen in treatment by these methods. Best results are secured when the treatment is supplemented with general hygienic and climatic measures.—*Ueber eigene Erfahrungen und Ergebnisse in der konservativen Behandlung der chirurgischen Tuberkulose nach der Calot-Injektions-Methode, T. Fohl, München. med. Wchnschr., June 13, 1924, lxxi, 777.*—(*E. R. L.*)

"Antioxygenes" and the Treatment of Tuberculosis.—Attention is drawn to the dangers of the medication of tuberculosis by the *antioxygenes*—phenol, guaiacol, etc. Metabolism is not augmented but slowed in tuberculosis, hence treatment should include exposure to ozonized air and accelerators of oxidation. The statements made are based on numerous urinalyses.—*Les "antioxygenes" et le traitment de la tuberculose, A. Pissavy and R. Monceaux, Meeting, Société de Thérapeutique, June 11, 1924, reported in Presse Méd., June 25, 1924, no. 51, 548.*—(*A. P.*)

Intravenous Calcium Therapy.—Intravenous injections of calcium chloride, highly recommended for the diarrhea, profuse sweats, vomiting and hemoptysis of the tuberculous, have in recent years been discontinued. Bertier reports a case in which, following the fourth injection, there was marked shock, accompanied by an intense febrile reaction, and he concluded that in such cases it is better not to resort to intravenous calcium therapy. A book by L. A. Rosen, professor in Moscow University, on the calcium treatment of tuberculosis has recently been published. The author has devoted himself to this subject for the past fifteen years, having studied it experimentally and clinically. He has followed carefully more than 200 cases of active tuberculosis. While in Germany 10 per cent and in France 50 per cent solutions are used, the Russian author does not exceed 1.5 per cent solutions. He has proved experimentally that solutions of 1.5 per cent are well borne by dogs, and solutions of 1 per cent by smaller animals. On the contrary, 5 and 10 per cent solutions are badly supported; the animal succumbs with symptoms of intoxication. The solutions are made of chemically pure calcium chloride dissolved in carefully distilled water. About 300 cc. of the solution are injected slowly into a vein, the rate not exceeding 15 to 20 cc. per minute. Tolerance to the solution increases as the disease retrogresses and is chiefly dependent on the condition of the myocardium. Treatment usually consists of two courses of 15 injections separated by a ten-day interval. Generally the injections are repeated every two days. But, according to the clinical course, it is sometimes necessary to increase the intervals during the first course. In incipient cases one course of injections may be sufficient. As a precautionary measure it should be repeated even in the absence of local physical signs. In the relatively early second-stage cases bacilli disappear from the sputum after the first course of treatment. In spite of this, and even though there are other symptoms of improvement, such as gain in weight and dropping of temperature, etc., one should not be content with a single series of injections. Afterward the patient is put on a diet rich in calcium. The results of this calcium therapy are, according to Rosen, as good as the results got in freezing the appendix. Amelioration is evidenced by increase in weight, disappearance of cough, the sputum becoming negative for tubercle bacilli, and lowering of the temperature. The treatment is more effective in cases showing a continuous fever than in patients presenting a lower temperature, but of the

hectic type, indicating a mixed infection. Physical signs clear up more slowly than the other manifestations of the disease.—*La calcithérapie intraveineuse dans le tuberculose pulmonaire, L. Cheinisse, Presse Méd., September 20, 1924, no. 76, 766.—(B. T. McM.)*

Recalcification Treatment of Tuberculosis and Leprosy.—Ferrier reports the results of the special treatment which he published in 1905. Of 62 pulmonary cases, there were 45 recoveries, about 72.58 per cent, and 17 deaths, or 27.42 per cent. Among the 18 other cases with the lesion localized in bone, tendon, pleura, skin or joints, there was one death from suppurative arthritis. Ankylosis occurred in all the joint cases, including the cases of Pott's disease. These facts support the conception of the body undergoing decalcification. A number of cases of leprosy were treated by the same method by reason of the similarity of the two bacilli. Four survived the treatment and are cured. Two have by negligence provoked activity in the disease. Resumption of the treatment was accompanied by retrogression. Five did not consent to treatment, 2 are dead, and in 3 other cases the malady is progressive.—*Traitment recalcifiant de la tuberculose et de la lèpre, P. Ferrier, Meeting, Académie de Médecine, July 1, 1924, Presse Méd., July 5, 1924, no. 54, 570.—(B. T. McM.)*

Administration of Calcium and Parathyroid to Tuberculous Guinea Pigs.—It has been held that in the tuberculous and those predisposed to tuberculosis there is a hypoparathyroidism, which curtails the final stages of calcium metabolism, as a result of which the calcium does not enter properly into true intracellular chemistry. This belief is based in part on the theory that the parathyroid glands are the controllers of calcium metabolism, a theory which seems now well established. With this in mind, experiments were done to see whether the administration of calcium and parathyroid substance, separately and together, would in any way influence the course of tuberculosis in guinea pigs. As it was desired to produce a tuberculosis more nearly approaching the disease in human beings, R1, a greatly attenuated strain of human tubercle bacillus, was used for infecting the test guinea pigs. The injected animals each received 1 cc. of a heavy suspension of the bacilli intraperitoneally. Two series each of 7 animals were reported in full. Each series was arranged and treated as follows: 1. Tuberculous control. 2. Tuberculous, 1 gr. calcium lactate. 3. Tuberculous, 1/80 gr. parathyroid substance. 4. Tuberculous, 1 gr. calcium and 1/80 gr. parathyroid. 5. Nontuberculous, 1 gr. calcium. 6. Nontuberculous, 1/80 gr. parathyroid. 7. Nontuberculous, 1 gr. calcium and 1/80 gr. parathyroid. The medication was suspended in sterile distilled water, placed upon bread, and given once daily. This was continued for a period of three and one-half months. *Summary of results:* 1. The lesions were greater in the tuberculous control and less marked in the calcium-fed animals. In those given parathyroid and those getting both substances the lesions were still less marked. 2. The weight-gains bore an inverse relation to the size of the lesions, as would be expected and were much greater in those receiving combined medication. 3. The tuberculous animals receiving both drugs ate far more than either of the others and even more than normal guinea pigs under like conditions 4. It would seem that if one wishes to make a guinea pig gain enormously while taking calcium and parathyroid, the guinea pig should be inoculated with tubercle bacilli. 5. The results in these series make it highly suggestive that similar results might be obtained in certain classes of patients with tuberculosis.—*The Interesting Behavior of Tuberculous Guinea Pigs under Parathyroid and Calcium Administration; A Preliminary Report, P. S. Pelouze and R. C. Rosenberger, Am. J. M. Sc., October, 1924, xlxviii, 546.—(J. S. W.)*

Silicic-Acid Treatment of Tuberculosis.—Silicic acid was administered to 71 tuberculous children for a period of over a month. It plays an important rôle in the body, especially as a result of its affinity for connective tissues and its special influence on the healing process in tuberculosis.—*Klinische und experimentelle Beiträge zur Frage der Kieselsäure-Therapie bei Tuberkulose, A. Frank, Beitr. z. Klin. d. Tuberk., June, 1923, lv, 470.—(H. J. C.)*

Silicic Acid in Treatment of Pulmonary Tuberculosis.—In a criticism of Kadisch's stand against the value of silicic acid in treating pulmonary tuberculosis, it is maintained that connective and scar-tissues require silica to aid fibrosis, and that in tuberculosis there is a paucity which lowers the bodily resistance to the tubercle bacillus. Lack of silica is a metabolism defect and it should be made up in assimilable form. A rapid response to treatment can hardly be expected.—*Bemerkung zu dem Aufsatz "Über das Silicium speziell die Kieselsäure, bei der Therapie der Lungentuberkulose," von Dr. E. Kadisch in dieser Zeitschrift, von Hahn, Beitr. z. Klin. d. Tuberk., September, 1923, lvi, 294.—(H. J. C.)*

Influence of Silistren on Leucocytes in Pulmonary Tuberculosis.—Silistren (silicic acid content 18 per cent) treatment (20 drops in a glass of water three times a day) for 10 to 11 weeks, in 26 afebrile and uncomplicated cases of pulmonary tuberculosis, gave an average increase of polymorphonuclear leucocytes of 0.768 per cent, eosinophiles 0.442 per cent, and an average decrease of lymphocytes of 0.69 per cent, large mononuclears and transitional forms of 0.25 per cent, and mast cells 0.27 per cent. As a whole, the medication was well tolerated; in 10 patients there occurred early digestive disturbances (vomiting, loss of appetite, gastric pains), which improved later during treatment. As a result of the blood changes, especially the increase in eosinophiles, the author believes the treatment displayed a favorable influence.—*Der Einfluss des Silistrens auf das Blutbild, A. Flaskämper, Ztschr. f. Tuberk., January, 1924, xxxix, 257.*—*(H. J. C.)*

Insulin Treatment of Diabetic Coma Complicating Pulmonary Tuberculosis.—The coma was cured by insulin but the patient underwent an acute exacerbation of his tuberculosis, which progressed unfavorably. Monier-Vinard has had a similar experience, the patient dying of tuberculosis after the cure of his coma.—*Coma diabétique et tuberculose pulmonaire: traitement par l'insuline, M. Rathery and Mlle. Dreyfus-Sée, Meeting, Soc. Méd. d. Hôp. d. Paris, June 20, 1924, reported in Presse Méd., July 2, 1924, no. 53, 559.*—*(A. P.)*

Surgery of Pulmonary Tuberculosis.—*Synopsis:* 1. Many patients with mainly unilateral pulmonary tuberculosis fail to obtain full benefit from artificial pneumothorax on account of adhesions. 2. Many of these are suitable subjects for surgery, the operation of choice being paravertebral thoracoplasty. The tuberculous lesions in the better lung, however, should be inactive or only slowly progressive. 3. Cauterization of adhesions, under thoracoscopic vision, should be reserved for those that are long, narrow and few. 4. In suitable cases operation should follow as soon as pneumothorax proves ineffective. 5. Thoracoplasty should be done in two stages, from two to three weeks apart, and no fewer than 125 cm. of ribs xi to i, inclusive, resected. Local and regional anesthesia is indicated for patients with more than 40 cc. of daily sputum; under this figure combined nitrous oxide-oxygen narcosis and local and regional anesthesia are best. 6. Operations producing only localized partial lung compression usually have more dangers than advantages. 7. Neurexairesis of the phrenic nerve may advantageously be performed after every artificial pneumothorax and before every thoracoplasty. 8. Some stiff-walled apical cavities are not obliterated by paravertebral thoracoplasty, and supplementary operations must be considered later. Occasionally drainage of tuberculous cavities is indicated. 9. Tuberculous empyema is best treated by repeated aspirations and air replacements, sometimes with antiseptic instillations or irrigations. Tube draingage is indicated only in the presence of dangerous secondary infection. 10. Favorable results in the surgery of pulmonary tuberculosis depend upon great discretion in the selection of cases, skilful execution, and strict attention to postoperative care, including not less than six months "curing," preferably at a sanatorium. 11. Among 1024 cases of advanced tuberculosis reported from 1918 to 1923, there was an immediate mortality (within a month) of 12 per cent; including an immediate operation mortality of 2 per cent; and 19 per cent thereafter, mostly from tuberculosis in the better lung or in other organs. The proportion of patients improved was 26 per cent, and cured 32 per cent. *Introduction:* It may be conservatively estimated that there are at present in this country 15,000 persons with pulmonary tuberculosis for whom surgical interference is indicated, many living at home, doomed to die, and spreading infection. Within the past five years Sauerbruch has alone reported over 500 operated cases while the total number from all clinics in the United States and Canada is 110. Archibald in 1912 was the first in America to operate. For fifteen years and more, surgical compression therapy has been developed and practised in Switzerland, Germany and the Scandinavian countries. The present paper is an attempt at a comprehensive survey of modern compression therapy and based upon a critical review and analysis of the world's literature of the past six years. *Evolution of Surgical Therapy: 1: Drainage of tuberculous cavities* has been practised in isolated cases for many centuries, but rarely advocated with enthusiasm. DeCerenville, in 1885, published a small series of cases and recently Sauerbruch has advocated it in selected cases. *2: Freund's operation of resecting the first costal cartilage* has in the past produced much controversy, but is now generally condemned as based on a wrong hypothesis, and having results very different from what Freund anticipated, and acting more in the nature of a small thoracoplasty. *3: Resection of diseased lung tissue* has been attempted, following successful experiments on animals, but usually with fatal results. The only modern

indication for resection is when one entire lung is almost completely destroyed by cavity formation, and the other is in fair condition. The successful cases of Macewen and Sauerbruch were of this type. *4: Collapse or compression therapy* was first attempted surgically by de Cerenville of Lausanne, in 1885, who understood the necessity of breaking the continuity of the bony unyielding thoracic cage. Quincke and Spengler performed small limited rib resections. The results, however, were unsatisfactory, and Brauer realized that clinical success depended upon obtaining a pulmonary compression comparable to that obtained by artificial pneumothorax. He, therefore, proposed the entire removal of ribs ii to x, and Friedrich began such operations in 1907. Although some successful results were obtained, it was soon realized that this operation was highly dangerous, the operative shock being terrific. Many patients died of acute respiratory insufficiency, and, in many, previously minimal lesions of the opposite lung progressed rapidly. The pendulum movement of the operated side of the chest, deprived of all bony support, caused embarrassment of the opposite lung. At present, therefore, this operation is obsolescent, and in the rare cases where employed should be done in two or more stages. The present types of operation are compromises between the restricted resections of the earlier thoracoplastics and the radical complete rib resections. Removal of those parts of the ribs posterior to their angles (over the costovertebral gutter) has been shown to be essential for satisfactory compression; it is further established that in nearly all cases it is necessary to resect the first rib to compress the apex. Wilms first realized that the removal of short lengths of ribs at their posterior ends would greatly reduce the chest capacity, without great operative shock, and his operation became known as *Wilms's columnar resection*. Sauerbruch modified Wilms's technique, insisting on doing the posterior operation in more than one stage, and in first removing the lower ribs to lessen the chances of aspiration. He also urged local and regional anesthesia, and proposed the convenient hookshaped incision embracing the scapular angle. In recent years a number of rather bizarre operations have been proposed, among the most important being Schläpfer's combined pulmonary arterial ligation and phrenicotomy. *Pathological anatomy and physiology:* Jessen is correct in saying that the problem of advanced pulmonary tuberculosis is a mechanical as well as immunological one. There is some difference of opinion as to how much thoracoplasty lessens the chest capacity. Saugman, after removing 134 cm. from 10 ribs, found at necropsy a reduction of from one-third to one-half the normal chest capacity. Sauerbruch says that after his operation the reduction in volume is only 300 to 500 cc., while Brauer says that his radical operation effects a reduction of 3000 cc. or two-thirds of a complete pneumothorax. Cloetta has shown that a moderate pulmonary compression causes a pulmonary hyperemia rather than ischemia, because when the lung is released the vessels become dilated. Only with a considerable degree of pressure are the vessels narrowed. Lung compression also determines a lymph stasis. Experiments with lamp-black have shown that the flow of lymph in the lungs is largely determined by respiratory movements. This lymph-stasis prevents dissemination of bacillary emboli and checks the constant tuberculization of the system. It probably also stimulates connective-tissue growth. The compressed lung, as Saugman has said, is emptied of its waste products like a pressed sponge, and following this much inflammation subsides. Those bronchi protected by heavy cartilage remain open and may later tend to dilate as fibrous tissue forms around them. Examination of a successfully compressed lung shows a fleshy mass, full of connective tissue, particularly around the blood and lymph vessels and bronchi, and as septa radiating from the subpleural layer. If any new tubercles are found, which are rare, they are noncaseous and contain many giant cells. These favorable effects, however, are apt to be seen only in disease predominantly proliferative or fibrous, rather than the exudative form. Nevertheless, the amount of connective tissue in a compressed tuberculous lung greatly exceeds that in an uncompressed lung, and it may even form in cachectic subjects. The factors responsible are (1) stimulating toxins in the stagnant lymph (2) chronic hyperemia and (3) cessation of lung function. Cavities, the walls of which are not very stiff, are obliterated to mere clefts by successful thoracoplasty; these then fill with granulation tissue rich in blood vessels and either become obliterated or lined by a smooth clean membrane. The uncompressed lung undergoes emphysema and hyperplasia and, according to Sauerbruch, moves much more after operation than before; hence the liability to dissemination of tubercle bacilli from active lesions within it. *Comparison of thoracoplasty and artificial pneumothorax:* The number of patients whose pulmonary disease is sufficiently unilateral to warrant lung compression is variously estimated at between 2 and 10 per cent. Matson, *et al.* attempted pneumo-

thorax in 600 of 7,000 cases, or 8.5 per cent; of these 20 per cent had no free pleural space, and 41.3 per cent permitted only limited compression. Their satisfactory compression yielded 45 per cent clinical cures as opposed to 15.5 per cent in the limited group. Saugman failed to produce satisfactory compression in 30 per cent of his attempts. He found 70 per cent of those with complete pneumothorax able to do "ordinary light work," 33 per cent of those with strictly limited adhesions, and only 11 per cent when there were extensive adhesions. Madinier and Saugman estimate that 4 to 8 per cent of patients are suitable for surgery, but Alexander is more conservative, giving an estimate of 2 per cent of unselected cases. Statistics seem to show that final results of pneumothorax and thoracoplasty are about the same: roughly, 35 per cent cured, 30 per cent improved, and 35 per cent not benefited or dead. Pneumothorax has the advantage of avoiding the dangers of acute circulatory and respiratory upsets, surgical shock, and postoperative pneumonia; also, there is less danger of lighting up foci elsewhere, and at any time the lung may be released, whereas thoracoplasty once done is beyond recall. However, 50 per cent of all pneumothoraces develop serous effusions, and 12.3 per cent of Matson's 480 cases developed purulent effusions. Cavity rupture into the pleura resulted fatally in 86 per cent of Sauerbruch's 73 cases, 57 of which were caused by attempts to stretch adhesions. Spontaneous pneumothorax occurred in 3.3 per cent of Matson's cases. In treating poor or ignorant people by pneumothorax poor results often accrue from premature abandonment of treatment by the patients. The question of cessation of treatment always presents difficulty. As the shrunken lung expands there is a tension on the encapsulating fibrous tissue, which is apt to be torn apart and tubercles or cavities exposed. Thoracoplasty then often becomes necessary. As a matter of fact, if the compressed lung was extensively diseased before being treated, it will become so filled with scar tissue after one or two years of treatment, that it is of little use in respiration. There are cases in which thoracoplasty would be preferable to pneumothorax. It is generally preferable to intrapleural pneumolysis or to attempts to stretch and tear adhesions under pressure, especially if attached to superficial lesions or cavities. It will collapse certain stiff walled cavities not amenable to pneumothorax. Jessen believes the lasting effects of thoracoplasty to be better in all very severe lesions, and Trembley would prefer it if two-thirds of the lung were badly diseased. Stöcklin also thinks it promises more for the future than pneumothorax. *Indications and contraindications:* At present, few internists will recommend operation until the patient has "cured" for many months and steadily lost ground. For many with experience, however, both surgeons and internists, comes the plea for earlier operation, especially in the case of unsatisfactory pneumothoraces. Davies advises operation if there has been no improvement after six months of faithful sanatorium regimen, or at once in cavity cases. Contrary to expectation, some very sick patients, with high fever, cavities and much sputum, stand operation well; but it should be avoided in those who have demonstrated abnormally poor resistance or whose history is very bad. In children more caution is needed than in adults, as the common caseous or hepatized forms with hilum foci, are not suitable. Moreover, pneumothorax is generally possible in children. It is a curious fact that better results are obtained from operation on the left lung than on the right. Sauerbruch found that about two and one-half times as many of the former lost tubercle bacilli from the sputum and about two and one-half times as many of the latter died. Bull's figures are even more striking, showing 2.2 per cent of operative deaths in left-sided cases, and 26 per cent in right-sided ones. In regard to lung pathology, it is of the greatest prognostic importance that the lesions be predominantly chronic and fibrous, or "productive." Progressive exudative lesions usually imply progressive tuberculous activity in both lungs with poor resistance, and the results of operation are apt to be bad. Some form of surgical compression is indicated for recurrent severe hemoptyses when artificial pneumothorax cannot be produced, or adhesions prevent closure of the bleeding vessel. Stöcklin advises pneumolysis with paraffin fill in preference to thoracoplasty, as mechanical conditions for expectoration are better and greater pressure can be exerted on the bleeding vessel; but Sauerbruch prefers his paravertebral thoracoplasty if the hemorrhages have been small and the patient is in good condition. The so called "good" or better lung has been called by Bull the "sword of Damocles." Brauer finds slow progression of the lesion in this lung in 10 to 15 per cent of those operated on, usually resulting in death. This progression may be accounted for by (1) increased work, (2) normal tendency of much tuberculous disease toward progression, and (3) activation by massive "autotuberculinization" caused by compression. Most clinicians agree that if a tuberculous process is demonstrable it must be small and limited, and non-progressive during several months of observation.

Sauerbruch attaches greater importance to the clinical signs than the roentgen ray in estimating activity, but uses both in conjunction. Certain preliminary test procedures, causing temporary paralysis of the phrenic nerve have been devised, such as freezing, the effects of which pass off within five to seven weeks. Both Saugman and Sauerbruch have obtained improvement when the better side was considerably involved at the time of operation, but warn that unpleasant results are more frequent. Next in importance to the contralateral lung in deciding for or against operation, is the condition of the cardiovascular system. Half of Stöcklin's operative deaths occurred from heart failure. Careful functional tests of the cardiovascular system are essential for sound judgment of operative suitability. As for complications, laryngeal tuberculosis is no contraindication unless severe, but on the contrary usually improves. Operation in the presence of tuberculous intestinal involvement, however, is generally condemned. Any organic nephritis, including amyloid degeneration, contraindicates thoracoplasty, as does diabetes of any thing more than mild degree. *Choice of operation:* In general, most patients for whom operation is indicated will do best after a two-stage Sauerbruch or Brauer operation. It will be found in a certain minority of cases operated on by either technique, that the compression has not been sufficient to control the disease; this is especially true of thick-walled cavities and infiltrative lesions. It thus becomes necessary to resort to further removal of ribs, either posteriorly or parasternally, or to perform pneumolysis. When even these measures fail cavity drainage is indicated. The end results of partial or incomplete operations have not been very successful. The principal objections are (1) increased risk of aspiration infection, (2) slipping of the diseased portion of the lung into the unnarrowed portion of the chest, thus nullifying the benefits of localized compression, (3) mechanical interference with the process of "settling" of the chest wall which occurs after the complete operation, and (4) the lymph flow is only partially checked on the diseased side. Gravesen, however, favors limiting resection to the lower ribs if only the lower lung is diseased. Also, partial procedures may be recommended for patients whose lesions are limited and shrunken, and demand release of tension by the bony cage, or for patients too ill to stand the operative shock of the complete operation. Wilms would resect the three upper ribs on each side for strictly circumscribed bilateral apical disease with fibrosis. *Preoperative management:* Saugman and Madinier strongly advise that all operations for pulmonary tuberculosis be performed in suitably equipped sanatoria rather than in general hospitals. An important prophylactic measure against aspiration of infected secretions is to insist that the patient empty his lung two hours, and again one hour before operation, by postural drainage. Broad experience has taught both Sauerbruch and Jessen to fear more than small preoperative doses of morphine. *Anesthesia:* Sauerbruch's preference is for straight ether whenever there is less than 30 cc. of sputum a day. Its use upon hundreds of patients with active pulmonary tuberculosis has convinced him that it has no unfavorable action on the lungs, unless by abolishing the cough reflex it allows aspiration of secretions. However, more often he is forced to use regional and local anesthesia, which he fears because of the toxic effects of large amounts of novocain. He limits himself to 0.9 gm. novocain, to which is added 0.001 cc. of adrenalin chloride, the solution being made isotonic. He infiltrates the line of incision with 50 cc. of 0.5 per cent solution, and then by the Schumaker technique injects 5 to 6 cc. of a 1 per cent solution around each intercostal nerve at the rib angles. Saugman tests the patient's susceptibility to novocain a few days before operation. He has tried to limit himself to 150 cc. of 0.5 per cent solution, and when the sputum is not excessive uses a little ether. Meeher and Frazer conclude that 1.5 to 2 gm. of novocain in 0.5 per cent solution are safe for local infiltration, and 1 gm. in 1 per cent solution of novocain-adrenalin for nerve blocking. Archibald, Welles, Hedblom and Gravesen prefer to combine novocain-adrenalin and light nitrous oxide-oxygen anesthesia, while Shortle and Gekler, Riviere and Romanis, and Willard Smith prefer nitrous oxide-oxygen alone; and Sauerbruch, Saugman, Bull and Davies prefer ether if the sputum is not excessive, or the patient extremely apprehensive. Some surgeons interrupt the intercostal nerves as far posteriorly as possible. Some inject them with alcohol. Sauerbruch resects 1 to 2 cm. of each where the periosteum is thick and edematous, in order to avoid postoperative intercostal neuralgia. *Sauerbruch's extrapleural paravertebral thoracoplasty:* The clinical results of this operation are better than those of any other, except possibly Brauer's modification of it. It causes little operative shock, rarely upsets respiration or circulation, and resulting deformity is slight. Providing the upper lobe is more diseased, ribs xi to v are first removed through a hook-shaped incision curving from the interscapular region for-

ward to the posterior axillary line. In the two-stage operation it is not necessary at the second operation to reopen the original incision. The second incision curves from the anterior edge of the trapezius down to the base of the neck posteriorly, then down to the seventh rib and around the angle of the scapula. The ribs are usually removed subperiosteally, but some operators also remove the periosteum. The skill employed in the rib resection largely determines the time consumed by the operation, the amount of shock and postoperative pain. The first rib is most difficult to remove, and a special long-necked shears is convenient for this. Either stage of the operation should be performed by a well-trained team in forty minutes. Sauerbruch believes speed is of great importance, and his highly trained team's operating time is ten to twelve minutes. Most surgeons of broad experience incline to remove greater lengths of rib than does Sauerbruch, who is often obliged to resort to secondary operations. He averages about 110 cm.; Bull, 120 cm.; Brauer, 125 cm.; and Jacobaeus and Key, 140 cm. The first rib must be resected, or at least divided as the chest hangs on it. It may be left intact only when the apex is so shrunken as to have sunk beneath the second rib. A 3 to 5 cm. resection of its posterior extremity is generally considered sufficient. The two-stage operation has the advantages of (1) less shock and circulatory and respiratory disturbance, (2) less severe toxic reactions and fewer exacerbations in the other lung, and (3) better chance of success. The advantages of a single operation are (1) much preferred by the patient, (2) risks of embolus, infection and anesthetic poisoning run only once, (3) muscles cut only once, and (4) more even lung compression and less chance of hemorrhage. Statistics are highly in favor of the two-stage operation; and in general it is to be preferred, exceptions being permitted if the patient is in excellent general condition, the mediastinum well-fixed, and the surgeon's technique sure and rapid. The second operation should be done within six weeks after the first. A partial thoracoplasty may be combined with a partial pneumothorax. The partial pneumothorax should be maintained for at least a year. If the pneumothorax should be "lost" and compression of that part still needed, completion of the thoracoplasty is indicated. *Brauer's Subscapular Extrapleural Paravertebral Thoracoplasty:* Brauer has used this technique since 1911 with gratifying results. It allows resection of greater lengths of rib from beneath the scapula, allowing it to fall in on the lung. A supplementary incision is sometimes made in the axilla. Brauer's plates show an even greater lung compression than that obtained by the old Brauer-Fredrich operation and the dangerous chest-wall flutter is eliminated. *Extrapleural pneumolysis:* This is rarely used except for the upper-lobe *apicolysis.* The procedure is indicated only to compress circumscribed lesions at the apex, especially cavities. Pneumolysis is of more value secondary to thoracoplasty, for cases in which stiff-walled cavities are insufficiently compressed. As an independent procedure it has the advantages and disadvantages of all partial procedures, especially these disadvantages: (1) the danger of tearing into infected pleura or lung, (2) fills and grafts frequently cause infection and are extruded and (3) large fills cause greater pressure upon the mediastinum than a modern thoracoplasty. For this operation the anterior or axillary routes are preferred, except by a few who employ a paravertebral incision. Great caution is needed to prevent tearing into superficial cavities or other lung lesions; the finger should always work against the chest wall rather than the lung, and a broad space created before advancing. The firmest adhesions are usually over the vertebral bodies. If a pulmonary cavity should be torn, it should be packed with gauze and further manipulations cease. Many kinds of fills have been used, including fresh or preserved omentum, lipomata, subcutaneous or abdominal fat, fibroids, pedicled grafts of pectoral muscles, paraffin, gauze, air, inflatable rubber bags. Sauerbruch prefers the tampon fill to all others; he packs snugly for six to eight weeks, and then permits the pocket to become filled with granulations and obliterated. Stöcklin prefers paraffin fills, and Tuffier fat, believing the latter is better tolerated and not so frequently eliminated. Archibald uses most of the sternal and costal fibres of the pectoralis major, and, if desired, all of the minor muscles, fashioning a large graft with its pedicle at the acromiothoracic axis. This graft is stuffed into the hole, and tacked with a few catgut stitches to the periosteum. It is almost certain to live, and function of the arm is little impaired. Bull has recently used this method. When the muscle does atrophy, the connective tissue makes a good bed for a subsequent paraffin fill. *Open intrapleural pneumolysis:* If the adhesions are in the upper chest it is usually necessary to resect a rib to obtain satisfactory exposure. Adhesions are divided close to the ribs. Bleeding vessels are ligated or cauterized. Reported results indicate that this procedure is a dangerous one. *Closed intrapleural pneumolysis:* Jacobaeus has devised a method with two cannulas and a cautery, and

he and five other physicians have successfully cauterized 85 (70 per cent) of 121 cases. The procedure is open to grave objections. Jacobaeus has had a mortality of 6 per cent, and Holmboe has seen the operation followed by hemorrhage, pyopneumothorax and thoracic sinus. Exudates, which may become purulent, are very common. Sudden movements of the patient may cause the cautery to enter the lung. Lung tissue or prolongation of a cavity may extend 1.5 cm. with a stout adhesion. Sauerbruch has never used the method and would prefer partial thoracoplasty or extrapleural pneumolysis. Alexander believes its use should be confined to cases with a few restricting adhesions at least 3 cm. in length and not over 0.75 cm. thick. *Paralysis of diaphragm:* In 1911 Stuertz proposed phrenicotomy for progressive lower lobe lesions, especially cavity. Since then its indications have been extended, and in Sauerbruch's clinic alone it has been used several hundred times. The phrenic nerve originates from cervical roots iii, iv and v. From the inferior cervical sympathetic ganglion and the suprapleural plexus it receives some sympathetic fibres. Twenty to 30 per cent of persons have an accessory phrenic, usually arising from the fifth cervical root and running either with the nerve to the subclavius, or separately to join the main stem 4 to 5 cm. from the first rib, central to the pulmonary hilum. The lower six intercostal nerves supply sensory fibres to the periphery of the diaphragm, and the twelfth nerve supplies motor innervation to a few fibres. When one-half of the diaphragm is completely paralyzed it rises passively into the chest and remains at rest. It may continue to mount for some months after operation unless hindered by adhesions, and atrophies to a parchment-like membrane. It is more exact to speak of the phrenicotomy as causing relaxation of the lung rather than compression. Clinical improvement is the rule after the procedure, and, contrary to expectation, cough and expectoration are easier than before, the abdominal muscles acting more quickly. After a simple phrenicotomy the diaphragm rises to a level 3 to 7 cm. higher than normal and spirometer readings are reduced 30 per cent. The chief points of value of the procedures are (1) as a test of the better lung when phrenicotomy is considered, (2) as a preliminary to complete thoracoplasty, (3) as a palliative measure in very sick patients with a view to later thoracoplasty, (4) in conjunction with artificial pneumothorax, (5) for the pain, dyspnea and irritating cough caused by diaphragmatic adhesion in cases of pneumothorax, and (6) as supplementary to every artificial pneumothorax (Baer). Sauerbruch and Zadek have noted fewer exudates in pneumothorax when the diaphragm has been paralyzed, and it is stated that the intrapleural gas is more slowly absorbed. Simple phrenicotomy is a minor operation which is performed in a few minutes, using a 6 cm. transverse incision in the posterior cervical triangle. The phrenic stem runs obliquely across the anterior surfaces of the sternomastoid muscle. From 2 to 4 cm. of the nerve should be resected to prevent regeneration. Felix performs a Thiersch exairesis of the nerve, twisting it out from beyond the place where accessory phrenics usually join it. Local anesthesia is sufficient, using 20 cc. novocain solution injected around cervical roots iii to v. Sultan extracts an average of 20 to 30 cm. The phrenic carries no centrifugal pain impulses, but manipulation of it sometimes causes severe chest pain by mechanical irritation of the mediastinal pleura, or by causing diaphragmatic cramp. Sauerbruch would not perform exairesis in the presence of a tuberculous empyema or adhesions over the nerve, as the freeing of infectious material might set up a fatal mediastinitis. Likewise, the twisting may cause reflex cardiac and respiratory disturbances, but no fatalities have been reported. Because of its simplicity and excellent immediate results it is certain that radical phrenicotomy will soon be extensively used in conjunction with other procedures. *Problem of tuberculous cavities:* Soft-walled cavities are usually easily collapsed by a good pneumothorax or a complete thoracoplasty, but stiff-walled ones may require supplementary operations. After paravertebral thoracoplasty a parasternal thoracoplasty may be tried, and, if still insufficient, extrapleural pneumolysis, and finally cavity drainage. Sauerbruch was led to advocate drainage by having seen some case do well after a paraffin fill or gauze tampon had ruptured into a cavity. After resecting sufficient lengths of two or three ribs, entrance is gained to the cavity by thermocautery (Sauerbruch) or knife (Jessen). Retained secretions are scooped out, and the cavity "saucerized" and filled with gauze. Packing is renewed until the cavity is filled with granulations and becomes obliterated. (Sauerbruch) reports 8 cases of primary drainage, with 2 early deaths and 6 improved, 4 very much so. The earlier reported results of cavity drainage were very poor, but no such rigid indications and contraindications were then followed. Drainage is contraindicated for multiple and honeycombed tuberculous cavities. *Tuberculous empyema:* Empyema secondary to pulmonary tuberculosis is a grave complication, and demands rare judg-

ment in treatment. The keynote is never to institute open drainage unless it is certain that the secondary infection is uncontrollable by other means. Turbid, purulent effusions, however, and those with secondary infection, demand interference for the reason that they tend to leave chronic, infected empyema cavities, and that deposits of fibrin and organization tend to draw a lung previously compressed out to the chest wall. Repeated partial aspirations may be carried out as often as necessary, and the aspirated pus replaced with air or nitrogen. Attempts to check the secondary infection may be made with irrigations of 1–5000 neutral acriflavin, 1–3000 gentian violet, and successes have been reported with 5 per cent methylene blue and 1 per cent formalin-glycerin. Amounts of solution that will not cause marked rise of intrapleural pressure are allowed to flow by gravity through a needle. It is important that the gas pressure in the pleural cavity after aspiration be neither too high nor too low; hence manometer readings are necessary through a needle and tube free from fluid. At the end of the operation a slightly negative pressure should be left to allow for possible rapid reaccumulation. A thoracic wall sinus at the site of the needle puncture is guarded against by using a narrow-gauge needle and injecting a few drops of tincture of iodine during withdrawal. Extrapleural thoracoplasty is indicated for these cases, especially if complicated by bronchopleural or pleuro-cutaneous fistula, in which repeated aspirations fail to obliterate the empyema cavity within a few months. An aspiration and replacement by air is performed a day or two before operation. If the case demands immediate primary drainage, as in the presence of virulent infection, every effort should be made to render the cavity and sinus as nearly sterile as possible before making the thoracoplasty incision. This is best accomplished by surgical solution of chlorinated soda if bronchial fistulae or superficial caseous lesions do not prevent its use. Cavity rupture during pneumothorax therapy demands immediate thoracotomy. It is probable that a large majority of all tuberculous empyemas are complicated by bronchial fistulae, which are largely responsible for their persistence. When these are large, and do not tend to close spontaneously, repeated aspiration and irrigation are rarely successful. Hager has attempted to close them by cauterization under the thoracoscope. *Postoperative course, complications, and management:* For the first few days there are pain, increased fever and pulse, and difficult expectoration, and perhaps cyanosis and dyspnea. As the system is flooded with toxins squeezed from the compressed lung, a "negative" phase of resistance exists, and all tuberculous lesions are susceptible to a "flare-up." These symptoms should disappear within one to three weeks. There is usually considerable pain in the chest, shoulder and arm for a few days. Occasionally, intercostal neuralgia results from the entangling of the nerve in scar-tissue or between rib-stumps. It is preferable that the patient lie slightly on the operated side during the first few weeks. If the temperature and pulse remain high for over a week the prognosis is poor; if they fail to drop toward normal within two or three weeks, pneumonia or a tuberculous extension is likely. It is of paramount importance that the patient be able to expectorate, but ineffectual and exhausting cough must not be allowed; hence, the regular and judicious use of morphine is indicated. Sauerbruch continues it from ten to fourteen days. The attendance of a nurse to support the operated side during coughing is important. The sputum curve, together with temperature and pulse, is important for prognosis. After every thoracoplasty there is some circulatory disturbance, during which stimulants or oxygen may be needed. Loosening or tightening of the dressings may be necessary. A certain amount of dyspnea is to be expected, due to toxemia, pain, cardiac disturbance, mediastinal encroachment on the sound lung, or too tight or loose a dressing. The wound should be protected with gauze and cotton, and compressed by broad adhesive straps from the opposite shoulder and loin. It is advised to change the dressing in 24 to 48 hours, although Sauerbruch leaves it till the eighth day. Next to cardiac failure, spread of disease in the lungs, especially the opposite lung, is the most dangerous postoperative complication. The new foci may be of the pneumonic type. In addition to the usual treatment, oxygen inhalations are recommended. Serous effusion on the unoperated side is a rare complication noted by Brauer and Spengler in two patients, in both cases transitory and relieved by aspiration. Sauerbruch does not allow his patients out of bed within two to three weeks after operation and keeps them under surgical supervision about two months. Others return them to sanatoria much earlier. It is during the succeeding months that fibrous encapsulation occurs. Physical examination of the chest may be very deceptive. The uncompressed lung becomes emphysematous, and heart and lung outlines difficult to determine, while functional cardiac murmurs are common. The compressed lung, even after the disease is arrested, presents well-marked abnormal

physical signs, and even the X-ray often helps but little. The clinical condition and symptoms are much more important. There is rarely any appreciable deformity after the modern paravertebral operation, certainly none detectable through the clothes, and no appreciable loss of arm and shoulder function. The deformity does not usually reach its maximum for one year. Some use supporting corsets to obviate scoliosis from early weight-bearing; others do not. Some scoliosis is usual, but it is rarely marked. It is generally convex toward the operated side in the upper two-thirds of the chest, and roughly proportional to the number and length of ribs resected, the youth of the patient, and the skill in postoperative management. *Results:* It is not entirely trustworthy to base judgment of surgical treatment on statistical reports, and different clinics vary in the proportion of different types of cases selected. Sauerbruch, out of 339 thoracoplasties, sometimes supplemented with other operations, has reported 61.6 per cent cured and improved, 33.6 per cent worse or dead. Stöcklin and Schreiber report 62.5 per cent "positive results," 37.5 per cent "negative." Alexander's collected series of 1024 cases during six years shows: cured, 32 per cent; improved, 2.6 per cent; worse or dead, 35 per cent. Mühsam and Zinn deny the permanence of the early favorable results. It is true that incomplete operations may cause only temporary amelioration; also that some patients properly operated on die after initial improvement; but with rare exceptions these deaths are due to progress of disease in the uncompressed lung or other organs. Brauer estimates such progress to occur in 10 to 15 per cent of all cases. The operative mortality, even including every complication possibly attributable to the operation, is not over 15 per cent. Almost every one of the 1024 cases collected and tabulated was desperately ill, with extensive and severe disease. That any appreciable number of these could be saved is surprising; that 32 per cent were cured is almost miraculous. For such cases nothing known compares with compression therapy (pneumothorax or surgery), and it deserves the active support of every physician dealing with the tuberculous.—*The Surgery of Pulmonary Tuberculosis, J. Alexander, Am. J. M. Sc., July-October, 1924, clxviii, 1, 268, 412, & 574.—(A. P.)*

Phrenicotomy.—Polemic with Schulte-Tigges regarding phrenico-exairesis and Goetze's radical phrenicotomy. There exist 240 exaireses without accident, 150 from the Münich Clinic and 90 others.—*Bemerkung zu der Mitteilung über die Phrenicotomiefrage von H. Schulte-Tigges in dieser Zeitschrift (Bd. 38), W. Felix, Zeitschr. f. Tuberk., November, 1923, xxxix, 119.—(H. J. C.)*

Artificial Pneumothorax and Phrenicotomy.—As a result of a study of two cases it is believed that phrenicotomy is of some value in combination with artificial pneumothorax. The two cases were unusual in that the involvement was mainly of the lower lobes. In one a complete pneumothorax was obtained while in the other it was prevented by adhesions on the lower lobe. It seems unimportant whether phrenicotomy is performed before or after pneumothorax. Especially satisfying results were obtained in the case with adhesions to the lower lobe. In a case of this type refills are less frequently necessary than in the absence of the phrenicotomy.—*Pneumothorax und Phrenikotomie, H. Maendl, Ztschr. f. Tuberk., October, 1923, xxxix, 30.—(H. J. C.)*

Artificial Pneumothorax.—Pneumothorax therapy is distinctively a treatment for cavities. Before instituting this treatment a trial should be given with intensive postural rest as advocated by Webb. Under the postural treatment the proportion of pneumothorax cases in the Albuquerque Sanatorium has dwindled to about one-fourth of what it had been, indicating that in three patients out of four prolonged postural rest has eradicated the cavities. By the term "eradicated" is meant that all X-ray evidence of cavities has disappeared, and, in the case of single cavities, sputum which had formerly been constantly positive has been just as constantly negative, or entirely absent. If this postural rest has no definite results within ninety days, artificial pneumothorax is induced. It is not safe to collapse parenchymatous tuberculous areas which have not broken down and discharged their contents. As a rule these areas are situated immediately beneath the surface of the lung, and ordinarily tend to rupture into a bronchus. Compression brings them nearer the pleura, and there is nothing to prevent them from rupturing and discharging into the pleural cavity, giving rise to a tuberculous empyema. Exudate develops in the majority of pneumothorax cases. These exudates are inflammatory and due to infection of the pleura with tubercle bacilli. It is more or less a matter of dosage of tubercle bacilli, as to whether we will have a clear, so called "sterile" exudate, or a cloudy one, or frank "tuberculous pus." The presence of exudate facilitates the development of empyema. For this reason all fluid accumulating in the chest in pneumothorax cases

is withdrawn as soon as detected. For aspiration, patients are placed in the recumbent position, the shoulders on one table, the body on another with a gap of about six inches between the two tables. The patient lies on the affected side with the area to be punctured in the space between the tables. Before the procedure is terminated the patient is turned on his back, and pressure conditions adjusted by replacing the fluid with air. If it is worth while removing the fluid at all it is certainly worth while getting out all there is. By removing exudates intrathoracic pressures are under control at all times. This control is left to chance when exudates remain for a long period of time. Small refills, not exceeding 400 cc. at short intervals, are better than large amounts at long intervals. In case of severe hemoptyses, as high as 1,000 cc. may be given. As a general rule, collapse is continued for one year after all symptoms have disappeared, particularly sputum containing tubercle bacilli. Then the lung is allowed to reexpand slowly. If then there is no sputum, an X-ray study is made both with the fluoroscope and stereoscopic plates. If a cavity is not demonstrable, the lung is allowed to expand still further, and if still there is no positive sputum, complete expansion is allowed. *Conclusions:* 1. That pulmonary consumption is a disease characterized by cavity formation; has a bad prognosis; and as a rule, if not interfered with, ultimately results fatally. 2. If pneumothorax is valuable in well-advanced cases, it is certainly more valuable when properly employed early in the disease. In a unilateral cavity case without contraindication it is unjust to the patient not to employ this procedure, if several months of intensive rest have produced no improvement. 3. It is a mistake to collapse large parenchymatous lesions which have not yet broken down. 4. Small doses frequently repeated are more logical and in practice more satisfactory than large doses at longer intervals. 5. Fluid should not be allowed to remain in the thoracic cavity undisturbed. Aspiration should aim to empty completely the chest of fluid, and this can readily be done. 6. X-ray study, both before and during the course of treatment, should be carried on with sufficient intensity to keep the physician informed at all times of what is transpiring in the chest. It is better to use the X-ray too often than not often enough.—*Pneumothorax Therapy in Tuberculosis, W. A. Gekler, Boston M. & S. J., November 13, 1924, cxci, 930.*—(*B. T. McM.*)

Artificial Pneumothorax.—This paper is a report to the Medical Research Council on Artificial pneumothorax. Cases are divided into the following groups: *A.* Patients with little or no powers of resistance, and a rapidly spreading acute infection. *B.* Patients with good powers of resistance and in the early stages of the disease. *C.* Patients wth medium resistance who have failed to improve under other forms of treatment. This group is subdivided into (1) Involvement of one lung only, (2) some involvement of the better lung, (3) involvement of a third or more of the better lung. *D.* Nontuberculous cases. The study covers 250 cases of artificial pneumothorax. The development of pleural effusion is a frequent occurrence. Those patients in group C (1) with effusion do as well as those without; those in group C (2) did not do so well as those without. These effusions are tuberculous exudates. Of 344 cases there was one case of fatal pleural shock. Pleural shock exists as a distinct entity from gas embolism. In two cases a spontaneous pneumothorax occurred on the better side and led to a fatal issue. In six cases there was a rupture of the visceral pleura on the treated side, leading to a pyopneumothorax. From this investigation it is concluded that artificial pneumothorax is a safe and satisfactory method of resting a diseased lung. Unilateral cases do better than bilateral cases. The great difference in the results of these two types of cases is strong evidence that the pneumothorax is the important factor in checking the disease. In bilateral cases the ultimate prognosis is not good. In the earlier cases the importance of rest is not appreciated. Fresh air and good food are necessary, but far more important is rest. It is wrong to wait to induce an artificial pneumothorax until all other treatment has failed and the patient is in an advanced stage of the disease. A patient is often too bad for treatment but never not bad enough. In bilateral cases the better lung should be watched, and if the disease spreads in it the pneumothorax should be stopped. In nontuberculous cases very good results are obtained with abscess of the lung, repeated hemoptysis and recurrent pleural effusion. In cases of bronchiectasis there is often improvement but the results are not so good, as there is usually a considerable amount of adherent pleura, and also in most cases the disease is bilateral. Artificial pneumothorax should be regarded as a safe method of resting the lung, not as a cure for tuberculosis, and should be used in conjunction with other methods of treatment. The success of the treatment is largely dependent on really keeping the lung at rest and treating each case individually.—*Artificial pneumothorax, L. S. T. Burrell,*

Lancet, July 26, 1924, ccvii, 167.—(B. T. McM.)

Indications and Contraindications for Artificial Pneumothorax.—Recently artificial pneumothorax has been advocated for cases of early pulmonary tuberculosis. Riviere is opposed to this because, in the first place, it is unnecessary, since early phthisis is a disease readily curable by other methods; in the second place it is inexpedient, since it brings with it risks and the chance of serious complications out of all proportion to the benefits it can confer. Pleural effusions and the deformities which may follow it are complications which cannot be avoided. On reëxpansion the pleural layers may become adherent and the patient be thereby deprived of this treatment at a later stage when it may be truly indicated. *Indications: 1:* In fairly early cases which do not respond to the ordinary rest and hygienic treatment. *2:* In advanced unilateral phthisis. *3:* In old fibrotic unilateral advanced cases which are semi-invalided. *4:* Cases of pleural effusion if there is evidence of active tuberculosis in the lung on the same side. *5:* Recurrent chronic pleural effusion. *6:* Certain cases of bronchiectasis. *7:* Cases of foreign body in a bronchus that cannot be removed through the bronchoscope. *8:* Certain cases of foreign body in the lung. *9:* For diagnostic purposes for relieving tumors and their attachments by radioscopy and thoracoscopy. *10:* In certain cases of abscess of the lung. *11:* As a preliminary to operation in certain cases. *12:* To control hemoptysis. *Contraindications: 1:* Active disease in both lungs (there are exceptions). *2:* Early phthisis which is becoming arrested by strict treatment on ordinary lines. *3:* Emphysema and asthma are said to be contraindications. *4:* Extensive tuberculous disease elsewhere. *5:* Reluctance, undue timidity, lack of patience or confidence on the part of the patient.—*The Indications and Contraindications for Artificial Pneumorax, F. G. Chandler, Brit. M. J., October 4, 1924, no. 3327, 617.—(B. T. McM.)*

Artificial Pneumothorax in Acute Pneumonic Tuberculosis.—It is a matter of general experience that a large proportion of cases of acute caseous (lobar pneumonic) phthisis terminate fatally, within three months, while nearly all the remainder succumb to fibrocaseous disease or bronchopneumonic extension within eighteen months, the few who remain alive being more or less hopelessly incapacitated by extensive disease. Radiographic examination of this type of cases shows, in addition to the pneumonic lesion, considerable bronchopneumonic involvement of the remainder of the same lung, and a similar type of involvement of varying degree in the opposite lung. However, artificial pneumothorax should be attempted if the involvement is not greater than one-third of the "healthy" lung. This secondary implication of the better lung is, in fact, a cogent reason for beginning pneumothorax treatment early, as not only is extension rapid but pleural adhesions form very quickly. It is not usually possible to diagnose this form of tuberculosis till the second or third week, since its early course resembles that of acute lobar pneumonia. The persistent, swinging temperature and evidence of softening lead to a correct diagnosis, and the discovery of tubercle bacilli in the sputum may be expected toward the end of the second week. Treatment by pneumothorax should be commenced not later than the end of the fourth week. Two cases are reported, in schoolboys of 15 and 16. In the first, results were noted almost immediately and in spite of the development later of a tuberculous empyema the end result was satisfactory. In the second case only a partial collapse was possible and this was later terminated by further development of adhesions and contraction of the pleural space. Even so, well marked benefit was obtained.—*Acute Pneumonic Pulmonary Tuberculosis Treated by Artificial Pneumothorax, J. Torrens and A. G. E. Wilcock, Brit. M. J., October 11, 1924, no. 3328, x, 666.—(A. P.)*

Prognostic Criteria for Artificial Pneumothorax.—This study is an analysis of certain outstandnng clinical phenomena occurring in the course of artificial-pneumothorax treatment. By treatment is meant the general conduct of these cases at a sanatorium apart from the actual artificial-pneumothorax treatment. The conclusions arrived at have no bearing on the question of the value of artificial pneumothorax, nor on the proper amounts of air to be used in, or the correct spacing of refills. The cases are all drawn from the working classes, and in laying down a course of treatment for them it has to be borne in mind that, with very few exceptions, they must earn their own living, the only alternative being the workhouse infirmary. The patients have been classified, as to the immediate results of treatment, as much improved, improved, *in statu quo*, worse, or dead. Much improved is practically symptom-free, apparently fit to work and earn a living. Improved means symptoms much ameliorated. Apparently fit means to be up and about and to do light work. *In statu quo*

means symptoms still present; unfit to earn a living; pyrexial or nonpyrexial. In this paper, *I. S. Q. (in statu quo)*, worse and dead patients are classified as dead. Pyrexia means a recorded mouth temperature during the day of 99°F. Relapse is any condition, accompanied by pyrexia or not, which has necessitated the patient's stopping exercise and being put on "rest" for four days or more. In the study of temperatures, the following definitions are used: *Regularity:* A regular temperature is taken as one in which the morning and evening range varies only by a fraction of a degree over a considerable period. A periodic temperature is regular, provided the amplitude remains fairly constant, and provided the swing of the crests does not vary much from the swing in the troughs. A spiky temperature is irregular. The swing is the daily fluctuation which occurs in the temperature as measured by the morning and evening records. *Periodicity:* When the mean of the morning and evening temperatures rises and falls at constant intervals. Comparatively slight evidences of periodicity have been accepted. *Conclusions: 1.* If a relapse occurs during the exercise treatment of an artificial-pneumothorax case, there are two salient points of interest: *a.* the longer it is, the worse is the prognosis; *b.* the earlier it occurs the less likely is the patient to do well. A relapse which takes place for the first time when the patient has reached an advanced grade of exercise seems to be of singularly little importance. If the patient is going to do badly he will relapse early; if he is going to do well he will relapse late or not at all. *2.* A regular temperature is of good prognostic significance; an irregular one is the reverse. In men a periodic temperature is an unfavorable feature. The daily variation seems to have no special significance. *3.* Patients who have done well have more often had a complete collapse than those who have done badly. *4.* It is clear that a considerable number of patients with bilateral disease are capable of responding well to artificial-pneumothorax treatment, and of reacting favorably to the system of graduated exercise which is given to them preparatory to their ingress once more into the world of activity. *5.* It is probably fair to say that the development of pleural fluid, so long as it be not of a purulent type, is a matter of supreme indifference to the prognosis of the case. It is interesting, too, to note that the advent of fluid is likely to be occasioned by exercise. *6.* Persistence of tubercle bacilli in the sputum after the induction of artificial pneumothorax is a feature of bad omen. Figures show that if the sputum remains positive the chances are 19 to 1 against the patient being discharged as much improved. *7.* One of the most valuable criteria of the patient's reaction to treatment is the change in the weight which occurs after his admission to the sanatorium. Though it is not uncommon for patients, even in the worse class, to gain a little in weight, it is very uncommon for those who are going to do well to lose any. How true this is can be seen from the tables which show that if a patient loses weight progressively after starting exercise the chances are 37 to 1 against his being discharged as much improved. An early loss in weight should prove a most valuable arresting signal and should lead to a careful reconsideration of the further treatment of the patient. *8.* The longer the patient's stay in the sanatorium the more weight he is likely to gain or the less is he likely to lose. Though not desiring to extol sanatorium treatment above other methods, this fact reflects very favorably on this form of treatment. This study is concerned with an examination of the results obtained by graduated exercise treatment of patients on whom an artificial pneumothorax has been induced either by choice or by necessity. This method is not advocated, as from the nature of the case it has been more or less compulsory, but under it no fewer than 49 per cent of an unselected, consecutive series of cases have been discharged as much improved and capable of earning their living in the world. With the indications gathered from this examination, with the danger signals more clearly pointed out than heretofore, and with the elucidation of certain promising features to give confidence in the pursuit of treatment, it is felt that it should not be impossible in the future to secure results which will be even more hopeful than those obtained in the present series.—*An Investigation into Criteria for Artificial Pneumothorax, R. C. Wingfield and G. S. Wilson, Lancet, July 26, 1924, ccvii, 163.*—(*B. T. McM.*)

Relative Value of Manometric Readings and Radiology in Artificial Pneumothorax.—At times the radioscopic picture fails to show clearly the outlines of a pneumothorax which undoubtedly exists. There are cases with marked pleural thickening, such that the entire field is clouded or gray, and the outlines of the collapsed lung cannot be discerned. It must also be remembered that the lung may not collapse concentrically, but be pushed back *en masse*. In such cases the investigation of intrapleural pressures by the most complete and precise means of measurement is indispensable. *Method of reading pressure: effective intra-*

pleural pressure: The gas introduced into the pleural cavity is subject to variations in pressure with the phases of the respiratory cycle. The ordinary water manometer, connected by tubing with the puncture needle, shows oscillations of considerable degree and varying greatly with the types of respiration. It is incorrect to assume that the arithmetical mean between inspiratory and expiratory readings represents the physiological effects of the pneumothorax, because the two phases are not ordinarily of equal duration. What is sought is to know the mean dynamic intrapleural pressure. This is obtained by interposing a constriction on the limb of the liquid column which will have the effect of deadening its oscillations. This is the same principle as Marey's "compensating manometer," by which he measured the dynamic pressure of the circulating blood. The actual effective pressure, then, is that which, if the lung were confined in an immobile cage, would exert the same pressure on it over a given period as does the variable pressure corresponding to the costodiaphragmatic play. One can demonstrate the function of the compensatory manometer by insufflating a rubber balloon and, with the fingers alternately compressing and releasing it, provoking movements in the manometer tube connected with it similar to those of respiration. *Comparison of the compensating manometer with other means of measuring intrapleural pressure: 1. Kuss's method:* Kuss measures the intrapleural pressure by means of the apparatus for insufflation, which constitutes a manometer on a large scale sufficient to deaden oscillations. When the fluid ceases to move from one flask to the other the difference in their levels is read as the intrapleural pressure. This method is open to the following criticisms: (a) its extreme slowness; (b) it cannot record any pressure until air has entered the pleural space, hence one can take no initial reading. *2. Bertier's method:* Bertier has sought to deaden oscillations by using, in addition to the water manometer, one filled with a mixture of oil and chloroform. It cannot be conceded, however, that the reading obtained measures the actual dynamic pressure, and, furthermore, the viscosity and density of this mixture change with the temperature. *3. Jousset's method:* This manometer is rather similar to the compensating manometer of Marey, but the constriction, instead of being interposed in the column of liquid, is interposed in the path of the gaseous column. *Practical value of determining effective intrapleural pressure:* It permits us to distinguish two different types of pneumothorax, relaxation and compression pneumothorax, which have entirely different effects on the lung. It is admitted that a lung free from adhesions tends, if gas is admitted to the pleura, to collapse toward the hilum. Experience shows that a negative intrapleural pressure is the bond between the lung and chest wall, and that with an entirely empty pleura the two meet. With gas introduced, however, at a pressure equal to the atmosphere this bond is severed, and the lung, collapsed toward the hilum, no longer participates in respiratory movements. If the pressure is further increased the lung is subject to compression which alters its architecture. *A priori*, there is nothing to show that any of the beneficial effects of pneumothorax are due to compression rather than repose, and, therefore, in the case of a free pleura a *pneumothorax de repos* should be preferred. The other type may be dangerous, for it is probable that, besides its mechanical effects on healthy parts, it may traumatize the diseased parts by tension on adhesions, rupture of bands, and intoxication by expression of caseous foci. Positive pressures should be reserved for very special cases in which the other type of pneumothorax is ineffective. Jousset has criticized the distinction made by Leuret, *et al.*, holding that there is really no *pneumothorax de repos*, even with positive pressures, movements of the lung always being demonstrable, and has cited Lindblom's observations that the alveoli are never completely obliterated, and that air circulation persists. It is true that the collapsed lung particpates, as do the heart and mediastinum, in movements synchronous with respiration, but these are movements *en masse*, and quite different from the respiratory expansion and contraction, and do not lead to a filling of the alveoli. Because alveoli may be seen on cut section does not prove that there is any real circulation of air. Pressures over +4 block not only the pneumothorax lung in the rabbit but also the opposite lung, and cause death from asphyxia. *Pneumothorax de compression* should be reserved for cases in which the presence of adhesions prevents the elastic recoil of the lung, or in which such recoil is insufficient to efface large diseased cavities. Positive pressures are especially justifiable in a small incomplete pneumothorax, in which the insufficiency of the lung surface acted upon is supplemented by the intensity of that action, as the pressure may be transmitted to other parts of the lung. Here the aim is to diminish the extent of lung to which respiratory movements may be transmitted. This type of pneumothorax should be used in treating lung abscess. *Curves of insufflation and their diagnostic value:* From careful observations

the following laws have been deduced: 1. Large pleural cavities give slowly rising curves, 100 cc. not causing over 0.5 cm. rise in pressure. 2. Small pleural cavities give steep, rapidly rising curves in proportion to their smallness. 3. When a large cavity not containing fluid gives a steep curve it is because the lung has become less compressible. 4. The curves of insufflation of any subject remain the same as long as conditions in the pleural cavity remain the same. (a) Transformation from a steep to a gentle curve indicates rupture of adhesions. (b) Transformation from a gentle to a steep curve almost infallibly indicates the presence of a liquid exudate. 5. When the curve of insufflation remains horizontal, either the gas is being introduced outside the pleural cavity, or there exists a large pleuropulmonary fistula freely communicating. 6. When coughing causes a sudden fall in the effective pressure, either there exists a narrow pleuropulmonary fistula, or the pleura is partitioned off and the gas is driven into a pocket. *Description of the apparatus of Leuret and Delmas:* This consists of an apparatus for insufflation or aspiration, and a manometric system. Two 500 cc. Wolf bottles are used, fixed on a metal frame, the upper inverted, and there are three separate tubular projections from each, connected with each other by glass tubing passing through corks, and controlled by stop-cocks. There is a "distributor" with five connections, all labeled, and between it and the puncture needle are branches leading to the two manometers, which are U-shaped, one being an ordinary manometer, the other the special "compensating manometer" described. The insufflator can be used with any kind of gas introduced into any body cavity, such as pneumoperitoneum, or one may aspirate at any time changing from insufflation to aspiration by a single movement, and accurate pressure measurements may be taken at any stage. To obtain high pressures, a Richardson bulb is used.—*Valeurs respectives des données manométriques et de la radiologie dans le pneumothorax artificiel, E. Leuret and P. Delmas-Marsalet, Rev. d. l. Tuberc., June, 1924, v, 332.*—(*A. P.*)

Mediastinal Hernia in Artificial Pneumothorax.—The end of therapeutic pneumothorax is to realize the collapse of the diseased lung, but with the minimum pressure sufficient to arrest the pathological process without injuring neighboring organs. Disturbance of the mediastinum and the delicate organs it encloses causes functional troubles, such as dyspnea on exertion and tachycardia, uncomfortable for the patient, and may lead to a dislocation of the mediastinal partition without the pulmonary compression being either complete or effective. The following troubles may be encountered: *1: Displacement of the heart,* especially in cases of left-sided pneumothorax, in which one may have true dextrocardias. *2: Displacement en masse of the mediastinum,* which swings to the opposite side. In left pneumothorax this is especially noticeable and a clear band may appear to the right of the sternum. There may also be rhythmic or pendular movements of the mediastinum, possibly associated with Kienbock's paradoxical movement of the diaphragm. Mediastinal displacements are well recognized, but localized bulgings or hernias are often missed. *3: Localized hernias of the mediastinum* are more often seen in young subjects. Four of five patients with this condition were from 16 to 18 years of age; one was 30. They are much more common in the course of left pneumothorax, generally appear early and under pressures less than zero, and in patients with an intact nondiseased pleura. The furthest point of the salient may be as much as 8 cm. from the border of the mediastinum proper. The location is usually above the third rib. The hernia varies with the respiratory movements, increasing with expiration and diminishing with inspiration. Examination of the patient may fail to reveal the existence of an extensive mediastinal hernia, although the signs of left pneumothorax may be found in the right upper pectoral region. *Pathology of mediastinal hernia:* Nitch has shown that the mediastinum presents two weak or vulnerable points; one in its posterior inferior portion, the other high up at the level of the first three ribs. Grocco's sign, or paravertebral basal dulness, so often accompanying serofibrinous pleurisy, is probably due to displacement of the posterior part of the mediastinum by fluid, especially in children. Mediastinal hernia, as seen in pneumothorax, however, is not a liquid but a gaseous displacement. At its anterior weak point, owing to atrophy of the thymus in the adult, the mediastinum contains only a light areolar tissue, and when the pleura is very distensible and a certain gas pressure reached this point gives way. Mediastinal hernia will be aggravated by any intrapleural overpressure, and this need not be a positive pressure as read by the manometer. On the other hand, too little pressure will allow the lung to reëxpand and fail to accomplish clinical results. The proper procedure seems to be to keep the lung under as little pressure as will be effective, but sufficient, even though the mediastinal hernia still exists, realizing that the therapeu-

tic result is not always parallel to the degree of collapse. Although mediastinal hernia is ordinarily seen where the pleura is free and elastic, it may be produced in a thickened pleura by strong overpressure. Such facts indicate the necessity for careful judgment in the amounts of pressure employed. To create a pneumothorax is easy but it is on the conduct of the cure that success depends. The practice of pneumothorax requires not only special training, but close surveillance of the patient, with radiological control. If Forlanini's method is to be more widely diffused it should only be on the condition that it is practised by skilful and prudent hands; otherwise, an admirable method will be discredited.—*La hernie du médiastin au cours du pneumothorax thérapeutique, Dumarest and Brette, Rev. d. l. Tuberc., June, 1924, v, 321.*—(*A. P.*)

Treatment of Pleural Exudates from Artificial Pneumothorax.—Many factors account for the formation of an exudate following pneumothorax treatment, such as loss of the sodium-calcium balance of the body, excess of sodium, and disturbances of the respiratory mechanics and cardiac function. All these occasion the water retention essential to exudate formation. To combat this condition calcium is administered as calcium chloride 30, potassium acetate 60, water 285 (a teaspoonful several times daily). As an adjunct to this, codliver oil is given to increase the vitamines. Gymnastic exercises and massage are added for the respiration and heart. Small amounts of gas only are used for pneumothorax. Since instituting this form of treatment fewer cases have developed exudates, and the exudates occurring take a more favorable course.—*Behandlung von Pleuraexsudaten, speziell von solchen die unter Behandlung mit Pneumothorax artificialis entstanden. Etwas über Resorptionsprozesse im Organismus bei Tuberkulose, N. Lunde, Ztschr. f. Tuberk., December, 1923, xxxix, 168.*—(*H. J. C.*)

Artificial Pneumothorax in Tuberculosis with Diabetes and Hyperthyroidism.—The case is cited of a woman with extensive febrile pulmonary tuberculosis and a large cavity, the evolution of which was checked by artificial pneumothorax, although the patient was an hereditary diabetic and affected with goitre, with marked tachycardia, tremor and accelerated basal metabolism. The patient became apyretic, expectoration diminished, bacilli disappeared, and she gained about 20 kg., although carbohydrates were restricted sufficiently to overcome glycosuria, and blood sugar was brought near normal. Diabetes, far from contraindicating pneumothorax, ought to hasten the intervention to check the tendency toward extension of the pulmonary lesions so evident in glycosuria.—*Diabète et tuberculose chez une goitreuse légèrement basedowienne; pneumothorax thérapeutique; guérison clinique, L. Bernard and M. Salomon, Meeting, Soc. Méd. d. Hôp. d. Paris, July 11, 1924, reported in Presse Méd., July 16, 1924, no. 57, 605.*—(*A. P.*)

Cauterization of Pleural Adhesions.—A personal experience in 40 cases with endothoracic cauterization of pleuritic adhesions during artificial pneumothorax is reported. The instrument used is a thoracoscope longer and 1 mm. thicker than that described by Jacobaeus. A better view is obtained by means of a larger light and better optical conditions. An increase of view from 47° to 60° is attained. Deep orientation has been improved by centimetre marks on the trocar and thoracoscope. The primary danger is delayed empyema, but it is not common. It is difficult to determine whether this is due to the cautery or a spontaneous rupture. Clinical improvement is showed by declining temperature, freedom from bacilli, loss of sputum and disappearance of toxic symptoms. These are associated with the success of the lung collapse. At times marked adhesions disappeared within a month even if not completely severed. A number of interesting case reports are given. In 2 cases of exudative pleuritis and one case of exudative peritonitis exploratory examination determined the diagnosis of tuberculosis, verified by microscopic examination and animal inoculation.—*Weitere Erfahrungen mit der Kaustik im Pleuraraum und der Thorako- und Laparoskopie, Unverricht, Beitr. z. Klin. d. Tuberk., June, 1923, lv, 296.*—(*H. J. C.*)

Cryptoscope in Artificial Pneumothorax.—In performing artificial pneumothorax the authors used the cryptoscope (*Kryptoskop*, made by Siemens and Halske, Berlin). The exact site of the needle in primary inflations and refills can thus be determined.—*Pneumothoraxanlage unter Leitung des Kryptoskops, K. Loening and T. Blick, Beitr, z. klin. d. Tuberk., June, 1923, lvi, 116.*—(*H. J. C.*)

Effects of Ultraviolet Radiation.—While the therapeutic value of ultraviolet radiation is now universally recognized, it is important to realize that all the benefits obtained by insolation are not due to the effect of light. Exposure of the naked body to cool air has been shown to raise markedly the basal metabolism. At the

same time the breathing of cool air will cause a flow of secretion from the respiratory mucous membrane. These beneficial effects are independent of any radiation effects and must not be confused with them. It must be remembered that no rays reaching us from the sun are shorter than 290 millimicra. The rays from the carbon arc are most like solar radiations, whereas those from the tungsten arc and quartz-mercury vapor lamps give out some very short rays. There are two ways in which ultraviolet radiations may act beneficially: (1) by increasing the bactericidal power of the blood, and (2) by activating the vitamines in the body. The former result is probably brought about by the warming of the blood through the action of the dark heat and the visible rays, and the absorption of the products of tissue damage acting as a stimulant to immunizing mechanisms. It has recently been shown that "any insult to the skin, whether produced by ultraviolet and invisible rays, ar by dark heat, or by blistering agents, appears to provoke or increase the defensive power of the body." It is now known that the bactericidal power of the blood is not always increased by ultraviolet radiation, but that in certain patients in which it is already low ultraviolet rays will depress it still further. This is probably the reason why some patients get worse with ultraviolet radiations. Vitamine A has been shown to be an important factor in controlling the normal growth and calcification of the body. Ultraviolet light activates the fat-soluble A vitamine already stored in the body, although it has no power of synthesizing it. Ultraviolet radiation applied without giving vitamine A in sufficient quantity would have no beneficial effect. The assertion that the degree of *pigmentation* is an indication of the resistance of the body is wrong. The yellowish type of pigmentation, however, which may follow the use of any source of ultraviolet radiation is chiefly found in patients not making satisfactory progress. Apart from this yellow type, the degree and kind of pigmentation are no indication of the response of the patient to treatment.—*The Therapeutic Effects of Ultraviolet Radiations, C. L. Pattison, Lancet, October 18, 1924, ccvii, 798.—(J. S. W.)*

Ultraviolet Rays and Radiotherapy in Localized Tuberculosis.—This report is based on 200 cases and about 3,500 exposures. There are two principal reactions of an irradiated body, actinic erythema and pigmentation. The former's usefulness is generally overlooked in producing widespread circulatory changes and through the vasomotor sympathetics affecting internal organs. Gassul has shown that a strong irradiation may induce congestion of the liver, spleen, and glands of internal secretion. Following an actinic erythema the secretion of a fistula may be checked, pains relieved and the general state improved. Using the quartz lamp, treatment is begun for one minute anteriorly and posteriorly at a distance of 50–70 cm., which distance is gradually diminished by 5 or 10 cm. down to 20–30 cm. When erythema occurs the dose is diminished by one-half or one-third. Erythema is to be avoided in cases of pulmonary tuberculosis, serous peritonitis, and in the presence of fever. The most striking results are obtained in cutaneous localization, cold abscesses, adenitis, osteoarthritis, and fistulous lesions in general. Improvement is often noted for a few weeks, and then progress comes to a standstill. In such cases, X-ray therapy may yield good results, and may be combined. This polyradiotherapy utilizes most of the radiations between 1,200 and 12,000 Angström units. The roentgen rays exert chiefly a local action, the ultraviolet a general action, and the infrared an analgesic and hyperemic action. Recent forms of adenitis do not always respond. Caseating forms, treated by radiotherapy alone, often ulcerate, but the combined treatments avoid this. Initial puncture may be advisable. The final results are most remarkable, large glandular masses often disappearing entirely. Dry forms of peritonitis respond well. For cutaneous lesions the high frequency electric current may be added. If X-rays are used, they are applied every three weeks, 3 to 5 H under a 5 mm. aluminum filter. The use of these other measures avoids absolute dependence upon the weather or climate in the application of treatment.—*Les rayons ultraviolets et les associations radiothérapiques dans les tuberculoses localisées, J. Saidman, Presse Méd., July 2, 1924, no. 53, 555.—(A. P.)*

Quartz Lamp Treatment.—The lamp used is the quartz mercury vapor lamp. It produces ultraviolet rays of 400 to 200 millimicra wave-length. It is worked from direct current of 250 volts with a resistance so that 140 burner volts are produced with 2.5 current amperes. The technique employed is that of Baeh, daily exposures starting at three minutes at 39-inch distance. The time of exposure is increased three minutes each day and the distance diminished by 4 inches at short intervals until thirty to forty-five minutes at 20 inches is reached. The eyes are protected by glasses. The penetrating powers are increased by painting the skin with a colloidal silica ointment. The simultaneous use of the 1,000

candle-power radiant heat lamp enhances the effect. The rays produce an erythema of the skin which is followed by pigmentation. The rays are absorbed by the first half-millimetre of the skin, as there are no heat rays. The exact mechanism of the beneficial results is unknown. It may be due to the effect on the general metabolism through the action on the skin, phagocytosis, increased blood exchange, etc. The good results are most marked in tuberculous cervical adenitis, lupus, and tuberculides. That the good results are not due to auxiliary treatment is evident by the fact that those who attend as out-patients do equally well.—*Quartz Lamp Treatment, N. Robertson, Tubercle, August, 1924, v, 527.*—(*B. T. McM.*)

Artificial Light Baths.—In the British Isles, and in northern latitudes generally, the number of days on which sunlight is available is small, and it is necessary to maintain continuity of treatment, to supplement the sun's rays by efficient artificial illuminants. Those commonly used are powerful carbon arcs and mercury vapor lamps. Reyn, the director of the Finsen Light Institute of Copenhagen, holds strongly that the best results are obtained with large carbon arcs, and his installation consists of a number of arc lamps of 50 to 75 amperes. This arc has also been used with success at the London Hospital. Patients are treated either in the sitting or recumbent position. The exposures start at half an hour and progress until two or even four hours are given. The eyes are protected with an opaque mask. In three or four weeks the skin becomes in many instances pigmented. The advantage claimed for the carbon arc is that its spectrum approaches that of the sun, especially by having a tungsten-paste core to the positive carbon. In the mercury vapor (quartz) lamp a very high actinic illumination is obtained. The patient lies or stands at a distance of about 3 feet, and at the beginning of the treatment exposures are given to small areas, and both the area and length of exposure are gradually increased until the whole of the back or front of the body receives half an hour's illumination. An inflammatory reaction with erythema, slight vesication, and desquamation is common, and after a series of exposures the skin becomes strongly pigmented. The most striking results have been obtained in cutaneous and surgical tuberculosis. In pulmonary disease there is danger of a flare-up. It is still uncertain by what means the light bath produces its effect. Not only are tuberculous processes beneficially affected, but the patient's general condition improves remarkably. There is no material alteration in the basal metabolism. In both animals and man the bactericial power of the blood is increased by exposure of the body to actinic light. In animals this increase is of some hours duration only. Pigmentation of the skin may be looked on as an indication of efficiency.—*Artificial Light Baths in the Treatment of Tuberculois, J. H. Sequeira, Brit. J. Tuberc., July, 1924, xviii, 91.*—(*B. T. McM.*)

Effect of Ultraviolet Rays on Blood.—An amazing mass of clinical data has accumulated within the past decade regarding the therapeutic benefits from quartz or ultraviolet light. Absolute and sure-fire results have been observed to accrue in a patient's tissue metabolism. How the effects are produced is not entirely known. In many instances quartz light is a specific, and also life-saving. This study deals with the comparative blood chemical findings on a male patient after six consecutive years of quartz-light therapy, from the age of 38 to 44. It also shows the result comparatively after two subsequent years, from the age of 44 to 46, when no ultraviolet therapy was administered. The alpine sun ultraviolet lamp was used. There were regular exposures of the naked body for definite periods at a fixed distance from the burner. These periods were gradually increased and the distance from the burner diminished. In 1922, after five years of treatment, the complete blood analysis showed an increase in hemoglobin, erythrocytes, leucocytes, polymorphonuclears and a fall in blood sugar, nonprotein nitrogen, uric acid and creatinine. The carbon dioxide combining power of the blood increased from 47 to 66.2 per cent. After the two subsequent years, during which the treatment was discontinued, the blood analysis showed a picture more resembling the one at the outset of treatment, except that the carbon dioxide combining power of the blood plasma had not changed. Clinically, the patient was not of a marked virility such as he possessed at the termination of the five years' course of quartz light therapy. The physiological changes produced from quartz light therapy are eminently constructive.—*The Effects of Ultraviolet Light on Blood Chemistry, D. McCaskey, Med. J. & Rec., December 17, 1924, cxx, 589.*—(*B. T. McM.*)

Intrathoracic Changes after X-Ray Treatment.—It has been the clinical impression from time to time that fibrosis of the lungs follows superficial radiation over the chest, as, for instance, in carcinoma of the breast. Symptoms have an acute onset,

beginning two or three weeks after exposure, with dyspnea on exertion, cough without sputum, pain (sometimes) over the affected side and cardiac embarrassment; and X-ray plates of the chest at that time show considerable localized infiltration much like bronchopneumonic consolidation. Later the mottled appearance gives way to dense fibrosis. The amount of exposure varies widely with the susceptibility of the patient. In order to study this question more thoroughly, experimental animals were used. Early, the reaction was one of edema and congestion. After prolonged exposure animals developed a thickened pleura; often with a pleural effusion, pericardial thickening and effusion, toughness of the lung which on section was found to be markedly fibrotic, and necrosis and fibrosis of the myocardium. In the lungs the alveolar walls were thickened and the bronchial, and particularly the blood-vessel, walls were markedly thickened and fibrotic.—*Intrathoracic Changes Following X-Ray Treatment: A Clinical and Experimental Study, K. S. Davis, Radiology, October, 1924, iii, 301.*—(*H. S. W.*)

Recent Work on Tuberculin Therapy.—Tuberculin therapy, in very little favor in France, has recently been resurrected in Germany where Petruschky, Moro, and especially Ponndorf, have advocated its employment, not subcutaneously but by application to the intact skin or scarification. Ponndorf has written a book evidently destined for the extramedical public, which apparently takes the bait, as Sahli cites a Swiss newspaper which proclaims it extravagantly as the long sought means of conquering tuberculosis. Sahli is astonished that in a country where the people rebel against vaccination such a rude and uncertain procedure should be recommended. In a recent general review, F. Klemperer concludes that this method has nothing to add to tuberculin therapy. He believes tuberculin therapy lacks scientific basis, although admitting that from the empirical clinical view point it seems to be an adjuvant in suitable cases, especially definitely localized forms. The simple obtaining of a positive Pirquet reaction is by no means an indication for treatment. Among pulmonary cases, only those not responding favorably to general symptomatic treatment, but at the same time not acutely ill or febrile, should be considered. The exudative and very advanced forms are unsuitable. It is particularly, if not solely, in the fibrous torpid or slowly progressive forms that improvement is brought about by tuberculin. As for technique, Klemperer attaches little importance to the choice of tuberculin or way of introduction, but insists that the dosage be rigorously individualized. Feeble reactions are desirable, but before proceeding to the next dose all traces of a previous reaction must have disappeared. The interval and rate of progression of dosage are governed by the clinical results. In pulmonary tuberculosis the provocation of focal reactions is a much more delicate matter and less readily controlled than in external tuberculosis. Thus only the apyretic, torpid forms are suitable. Bezançon is more inclined to favor Sahli's method of desensitization. The latter uses Beraneck's tuberculin exclusively, which combines the properties of O. T. and B. E. It is injected intracutaneously, beginning with infinitesimal doses, the increase being guided by the intensity of the skin reaction; they should be increased as the latter diminishes. Bezançon believes that patients so treated are less liable to the febrile congestive accidents which often befall the tuberculous. Recently Madeleine and Paul Toussaint have combined pneumothorax and tuberculin treatment at the popular sanatoria at La Hulpe-Waterloo, beginning with the tuberculin prior to subjecting the patients to the brutal autotuberculization consequent on pneumothorax reactions. They use small doses of solid purified tuberculin, never given too close to the pneumothorax insufflations and suspended in case of a focal reaction. Fischer, of Montana, Switzerland, injects subcutaneously a mixture of tuberculin and antiserum, which he claims ordinarily prevents any general or focal reaction. Numerous observations are needed to verify this.—*Quelques travaux récente sur la tuberculinothérapie, L. Cheinisse, Presse Méd., July 12, 1924, no. 56, 589.*—(*A. P.*)

Tuberculin Standardization.—The proportion of the active principle of tuberculin present in different samples is not constant, hence, in clinical work, it is necessary to know with reasonable accuracy the strength or toxicity of each sample used; and in scientific work this is imperative in order to obtain comparable results. The methods of standardization in vogue at present are: 1. The determination of the lethal dose for tuberculous guinea pigs. This is the official German method. 2. Von Lingelsheim's intracerebral method on normal or tuberculous animals. 3. The quantitative Pirquet, and the intracutaneous reaction on tuberculous guinea pigs. 4. The quantitative Pirquet on human tuberculous subjects. All these methods are open to criticism. The first one is the one commonly used, but to obtain reasonably accurate results it is necessary to utilize a large number of animals which

makes the method troublesome and expensive. It would obviously be of great advantage to have an *in vitro* test for the standardization of old tuberculin, and for this purpose a precipitin test is described, by which it is possible readily and accurately to compare tuberculins of unknown strength with an established standard tuberculin. The technique is given in detail, and includes standard tuberculin, standard precipitating serum, special tubes and pipettes, artificial light arrangement, etc. The standard tuberculin used was a German product, and is referred to in the tests as the Frankfurt standard. For purposes of comparison, this is given an arbitrary strength of 100 units. The precipitating serum was obtained by immunizing a horse with diaplyte *B. tuberculosis* vaccine in increasing doses. Many tests were run at different dilutions and the theoretical accuracy of the method established. In comparing different commercial tuberculins with the Frankfurt standard much variation was found, the former ranging from 33.2 to more than 400 units per cc. Tuberculins alleged to be equal in strength to the standard varied considerably. To check up these findings, quantitative Pirquet tests were done on human cases of tuberculosis, using the modification of Cummins, a method which accurately measures the area of scarification. In most instances the strength found by the precipitin test is borne out by the *in vivo* test. By these methods it is also shown that tuberculin seems to be comparatively stable, and under ordinary conditions the precipitation and *in vivo* tests on any sample should continue to run parallel.—*A Precipitin Method for the Standardization of Old Tuberculin and the Expression of Results in Standard Units, G. Dreyer and R. L. Vollum, Lancet, November 15, 1924, ccvii, 1003.*—(*J. S. W.*)

Exact Dosing with Tuberculin.—The question is raised, what data are needed for prescribing any medicament in an exact manner? In general there are two classes of compounds which can be so prescribed. The first of these consists of substances of known chemical composition and purity, such as compounds of arsenic. The second consists of substances of unknown chemical composition, but of such constant pharmacological action that dosing may be regulated according to the amount of active principle present in a preparation, as determined by biological reaction. Tuberculin belongs to neither of these groups. O. T. is a heterogeneous, colloidal, organic mixture of entirely unknown chemical composition. We only know that some fraction of it elicits the tuberculin reaction. The standard method of assaying tuberculin, based on the lethal dose for tuberculous guinea pigs in 24 hours, is an extremely crude form of biological test, in no way comparable in delicacy to a chemical reaction. There is an endless row of unknown and individual factors. With the tremendous doses used for this assay no uniformity is noted when ten animals are used. The error is multiplied by dilution in multiples of ten. A still more potent source of error is the fact that colloidal dispersity varies with dilution, and the potency does not vary arithmetically with dilution. It is this change in dispersion on dilution which is responsible for the relatively short-lived potency of diluted tuberculin. In view of these facts, it is certain that exact dosing with tuberculin has been carried to a ridiculous extreme. Undiluted tuberculin gives the smallest errors. Hence cutaneous and percutaneous methods are not so liable to gross errors as the methods based on the supposed possibility of exact dosability.—*Die "exacte Dosierbarkeit" des Alttuberkulins, Mayer and W. Böhme, München. med. Wchnschr., August 15, 1924, lxxi, 1123.*—(*E. R. L.*)

Results with Dreyer's Vaccine.—One hundred patients suffering from tuberculosis in various forms received diaplyte tuberculosis vaccine (Dreyer). For the most part these were pulmonary stage III cases, which were hanging fire after a preliminary treatnent along general hygienic lines. A few patients in stage II and one in stage I were also treated, as well as surgical and combined cases, cutaneous ulcers, sinuses, renal disease, and lupus. The minimum dose employed was 0.000001 mgm. and the maximum 0.00002 mgm. The dose at first was given weekly or twice a week, but after the first six weeks never at shorter intervals than one week. Details as to the rate of increase of dosage are not given. Forty-one of the above cases were treated personally by the author with the following results: 2 were definitely benefited; 4 were probably benefited; 14 were unaffected; 5 probably worse; 16 definitely worse; 2 patients died. A few of these cases are reported in detail. In discussing the effects of injections the following points are reported: *1: General reaction:* The temperature is usually unaffected, but the elevation may not come on until from four to six days. Not infrequently an initial fall in temperature is followed by a rise especially in pyrexial cases. The pulse is usually quickened from the start, however. After 10, 15 or more injections, without previous appreciable reaction, a violent and harmful reaction may take place. This is one of the chief dangers

of the treatment. Probably some focus of disease, previously walled in, is gradually softened until suddenly the blood-stream is flooded with toxins, and probably also with living bacilli. Other symptoms noted were malaise, dizziness, anorexia and headache. *2: Local reaction:* This never occured with the small doses employed. *3: Focal reaction:* This almost always occurs: it is the crux of the whole treatment and explains the chief difficulties. The maximum was reached in forty-eight hours but the period may be longer or shorter. On account of difficulty of detection, a focal reaction in the lungs was seldom observed, but in parts visible, such as lymph nodes, joints, ulcers, and abscesses, evidence of a focal reaction was practically always present. In conclusion, it is admitted that Dreyer's original claims have not been substantiated. His vaccine is considered as something potent, which is sometimes useful, but which we do not yet know how to use. If the focal reaction could be eliminated, as the local reaction has been, the path would be clear for safe investigations.—*Experiences with Diaplyte Vaccines, E. Ward, Tubercle, November, 1924, vi, 82.—(J. S. W.)*

Tuberculin Therapy in Dermatology.—Good effects are reported in cutaneous affections, from intramuscular and subcutaneous doses of tuberculin, increasing from 0.001 to 1 mgm. The best results were in tuberculides, such as erythema induratum, papulonecrotic tuberculides, and acne. The duration of the malady is shortened, but recurrence is common.—*La tuberculino-thérapie en dermatologie, Jeanselme and Burnier, Meeting, Société Francaise de Dermatologie et de Syphilographie, June 12, 1924, reported in Presse Méd., June 21, 1924, no. 50, 543.—(A. P.)*

Tuberculin Treatment of Ambulant Cases.—The results in 246 persons (36 of them children) treated with O. T., A. F., B.E., M.TbR., and Ponndorf and Petruschky tuberculins are reviewed. All treatments are begun with the weakest solution in each case and at weekly intervals with most preparations. Ambulant treatment must be carried out by practising physicians, who must keep in touch with recent progress. It cannot be left to the sanatoria and clinics only. Specific treatment differs in ambulant cases from those at rest, and is not a cure-all any more than is the sanatorium or pneumothorax treatment. Further study and trial of specific therpy is urged.—*Zwei Jahre ambulanter Tuberculinbehandlung, von Ohlen, Beitr. z. Klin. d. Tuberk., June, 1923, lvi, 123.—(H. J. C.)*

Effect of Tuberculin Therapy on Sedimentation of Red Blood Cells in Tuberculosis.—If, after tuberculin is injected into persons with tuberculosis in whom the question of activity is involved, the sedimentation reaction of the red blood cells changes, there is good reason to believe that the case is active. But certain controlled conditions must obtain before and during the testing.—*Kombination von Tuberkulininjektionen mit der Senkunggeschwindigkeit der roten Blutkörperchen bei der Lungentuberkulose, Tegtmeier, Deutsche med. Wchnschr., July 18, 1924, 1, 990.—(H. S. W.)*

Asthma and Tuberculin Treatment.—Tuberculosis is considered the basis of the majority of cases of bronchial asthma, and the author recommends tuberculin therapy with coincident hygienic-dietetic measures. The specific treatment should only be given by an experienced tuberculin therapeutist, since carelessness may lead to marked irritation of the disease process, with serious consequences.—*Asthma und Tuberkulintherapie, K. Stuhl, Ztschr. f. Tuberk., November, 1923, xxxix, 96,—(H. J. C.)*

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